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Bridgeport, CONN
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CONNECTICUT POST
Thursday, April 18, 2002

5 planets line up in unusual array

The five brightest planets visible from Earth have lined up in plain sight to form a spectacular celestial array that won't be seen again until 2040.

Through the next four weeks, Jupiter, Mars, Mercury, Saturn and Venus will appear tightly clustered in the Western sky. They will be visible in the evening with the naked eye.

Each evening, the alignment will assume different shapes, as the five planets take their orbital paths around the sun. The planets orbit in the same plane, like grooves in a phonograph record, only at different distances from the sun.

Similar bunchings occur every 20 years or so, though they are not always visible.

Scientists discover new order of insects

For the first time in nearly a century scientists have discovered a new order of insects.

The discovery by Danish and German researchers is detailed in a paper appearing in Friday's issue of the journal Science.

Just three of the paperclip-sized insects are known. They have been placed in the new

category "mantophasmatodea." The insects are just under an inch long and two of the examples under study in laboratories came from tropical Africa. The two had been in museums: An additional example was found encased in amber from Europe's Baltic region. The age of the African examples, now held for study in museums, is not known. The example in amber "is 45 million years old, but you can argue that they are surely much much older," said Klaus-Dieter Klass of the Max-Planck Institute for Limnology in Plon, Germany. He said that when comparing characteristics of these insects with known orders the researchers found they did not fit with any other group.

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A bug lady's life:
Science columnist gets bigger buzz

Ever wonder about the sex lives or flatulence rates of insects? May Berenbaum gives us the lowdown.

By F.N. D'ALESSIO
The Associated Press

- Like many other columnists before her, May Berenbaum was tempted to turn some of her best pieces into a book. She succumbed, and "Buzzwords" is the result.

URBANA, Ill.

If Berenbaum's name doesn't seem as familiar as that of Art Buchwald or Dave Barry, it probably means the reader is not among the 7,000 or so insect specialists who belong to the Entomological Society of America and read Berenbaum's column in their journal, American Entomologist.

It's a serious journal and Berenbaum is a serious scientist - head of glow-in-the-dark fungus gnat maggot or celebrating her favorite singer, "Weird Al" Yankovic, questions arise as to what sort of person Berenbaum is, and how she got that way. As a child, did she collect butterflies? Or did she fry ants with a magnifying glass?

"Absolutely not! And you should be ashamed of yourself for admitting you did, you awful person," she said in an interview.

"Actually, I used to be afraid of insects as a kid," she said. "I knew I wanted to be a biologist from a very early age, but I didn't get interested in insects until I was an undergraduate at Yale and took a course on terrestrial arthropods from a favorite professor who became my mentor. Insects are the most numerous terrestrial arthropods, and I got hooked.'

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And because insects can be found almost anywhere, they made good research subjects for Berenbaum, who suffers from a severe congenital form of motion sickness and doesn't

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University of Illinois and an expert on the chemical interactions between insects and plants. But her column, also titled "Buzzwords," is funny. Seriously.

And "Buzzwords," the book published by the Joseph Henry Press (tellingly subtitled "A Scientist Muses on Sex, Bugs, and Rock 'n' Roll"), is funny enough that Barry himself contributed a dust-cover blurb.

That's fitting, since many of Berenbaum's subjects would be congenial to the Bard of the Booger. She devotes considerable space to flatulence (termites and cockroaches are major offenders), kinky sex (praying mantises may have an unjustly bad

reputation, but dragonflies definitely like it really rough) and general lust (certain male beetles die a horrible death when denied sexual release). She discusses - right up Barry's favorite alley - the occurrence of bot fly maggots in the nasal passages. Berenbaum also examines images of insects in popular culture, particularly in rock lyrics and cheesy 1950s science fiction movies. She's become an expert on the latter genre through her role as founder and organizer of the university's annual Insect Fear Film Festival.

She also unknowingly lent her last name to "Bambi Berenbaum," a "luscious babe" of an entomologist featured in a 1996 episode of "The X-Files" titled "War of the Coprophages."

Because the real Berenbaum knows a bit about coprophages (dung eaters), scriptwriter Darin Morgan read some of her works while doing research and named his fictional creation in her honor.

Since she seems equally at home explaining the anatomy of the care to travel in search of specimens. When Berenbaum does travel, medication and "barf bags" in hand, it's generally to scientific conferenc es. One of those trips, to the entomological society's 1991 conference, led to her second career as a columnist.

"Biologists all love (The Far Side' cartoonist) Gary Larson, and we wanted him as a guest speaker, but he couldn't make it," she said. "The president of the society knew I was addicted to bad puns, so he asked me to fill in, and I did. I got some laughs, so he asked me if I wanted to write a column, and I agreed."

Now, biologists who might read other publications for Berenbaum's research on "Furanocoumarin metabolism in Papilio Polyxenes" can look to "Buzzwords" for her puns, as well as her views on such subjects

as entomophagy (eating bugs). Americans and Europeans may get a bit queasy at the thought, but the order Insecta is a frequent order "to go" in many parts of the world. And it's not just the worm in the tequila bottle or those plump grubs featured on CBS's "Survivor." Termites, beetles and crickets all have their aficionados.

"Cockroaches aren't that popular, but some tribal groups in Thailand do eat them," she said. "And locusts are even kosher - it says so right in Leviticus. So John the Baptist wasn't violating any dietary laws with his locusts and wild honey."

Once or twice a year, Berenbaum encourages members of an undergraduate class she teaches to chow down on a few creepy-crawlies. But as many of the students notice, Berenbaum never eats the insects herself.

"I can't; I'm a strict vegetarian," she said.

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Ancient Stingless Bee

Continued From Page Cl

features show the bee to be a new spe-
Kansas, concluded that the preserved
cies of the genus Trigona in the subfa-
mily of bees known as Meliponinae.
Although this species is now ex-
less bees of the Meliponinae subfa-
tinct, Dr. Grimaldi said, many sting-
mily thrive in tropical regions. Of to-
day's 20,000 bee species, one found in
the Amazon basin and as far north as
Panama is probably the closest rela-
tive of the fossil. In the Cretaceous
period, the northeastern United
States had a much warmer climate.
The oldest preserved bee previ-
ously discovered was about 45 million
years old. But scientists have as-
sumed that bees probably go back at
least 125 million years. Fossils of pol-
len, leaves and even flowers indicate

that this was the time when flowering plants appeared in profusion, and it is generally believed that bees evolved from ancestral wasps at about the same time.

The bee in amber seems to lend support to this timetable, or even to a much earlier appearance of flowering plants and bees.

Modern Wings and Hind Legs

Both Dr. Grimaldi and Dr. Michener noted the importance of the fossil bee being stingless. It was thus a fairly advanced species because it must have evolved considerably from ancestors with stingers. The females of most bee species have stingers, which are modifications of an egg-laying part of the body; male bees never have stingers. The fossil bee was female.

Other remarkably modern features of the fossil bee were its wings and hind legs, the entomologists said. The structure of the hind legs indicated that the bees carried pollen in the same way that modern bees do.

"This is very surprising," Dr. Michener said. "Most people would have thought that in 80 million years there would be more evolution than that. These must have had a good evolutionary condition then and just kept it."

Dr. Michener also suggested that to reach this advanced state, bees must have undergone "relatively rapid"

The Living Section
Wednesday in
The New York Times
pageC-4 cal 5,6
8 Dec 1987

evolution sometime before 80 million years ago. Thus, he said, the fossil bee certainly seems to confirm the idea that bees must be far older than 80-million years and probably date from at least 125 million years ago, or whenever flowering plants appeared.

Most scientists have long believed that the origin and diversification of flowering plants went hand in hand

with that of bees, on the supposition that many flowers require bees to
'I knew immediately this was the oldest bee.'
pollinate them and bees require. flowers for the proteins from pollen and carbohydrates from nectar.

Seeds in a Pod

James A. Doyle, a paleobotanist at the University of California at Davis, said recent findings indicate that some flowering plants may have emerged as much as 200 million years ago, long before the Cretaceous period. That would be consistent with the new possibility that bees, too, could have originated much earlier than had been thought.

The clearest plant fossil evidence, Dr. Doyle said, shows that angiosperms, the hardiest and most prevalent flowering plants, were not widespread until about 125 million years ago. Their "big burst" across the land began about 110 million years. ago, he said.

Angiosperms had seeds enclosed in a pod. This was a major evolutionary development because it afforded. more protection for seeds and improved their chances for germination. Some of the earliest flowering plants are similar to water lilies and sycamore trees. The magnolia family also goes back to the middle of the Cretaceous period.

"It seems that the diversification of angiosperms did take place in the Cretaceous," Dr. Doyle said. "The big question is, how that relates to their actual origin."

If that question is ever answered,. scientists said, the time of the origin of bees might also be determined. Amber found in the future may provide more clues. The oldest insects of- any kind found entombed in amber come from Lebanon and are about 120 million years old.

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40-Million-Year-Old Extinct Bee Yields Oldest Genetic Material

By MALCOLM W. BROWNE

By extracting gene fragments from insects preserved in amber for up to 40 million years, two independent teams of scientists have obtained the oldest DNA ever recovered from fossils.

Both groups of researchers succeeded in extracting fairly long sequences of nucleic acids, the building blocks of genes, from extinct insects embedded in amber found in the Dominican Republic.

They said the successful extraction of DNA from ancient amber-embedded specimens proved that substantial amounts of DNA could survive for many millions of years, far longer than many scientists had believed possible.

Analyses of the DNA found in the specimens has improved understanding of the evolutionary lines to which the extinct insects belonged.

Popular Theory Challenged

One analysis, which focused on a newly discovered extinct termite called Mastotermes electrodominicus, was conducted by Dr. Rob DeSalle, Dr. Ward Wheeler and Dr. David Grimaldi of the American Museum of Natural History in New York City, and John Gatesy of Yale University.

Keith Meyers/The New York Times

A study involving the extraction of DNA from an extinct termite preserved in amber for 25 million to 30 million years, above, challenges a formerly popular theory that termites evolved from cockroaches.

Amber mined in the Dominican Republic formed many millions of years ago from the sap of an extinct tropical legume called Hymenaea, Dr. Grimaldi said. Once the sap hardened as a plastic-like polymer, it became nearly as impermeable as glass. The amber polymer completely dries the body of any animal trapped in it and locks out any oxygen that would promote decomposition. The sap acts as a preservative in another way: it contains substances that kill bacteria that would otherwise rot tissue.

dinosaurs are created from gene grafts Neither the Museum of Natural His- | been careful to keep his speculations
of dinosaur DNA extracted from fossil tory team nor the California group within the bounds suggested by real
flies in amber. Dr. Poinar himself, and could even guess where the DNA frag- technology."
several other scientists, are assisting ments they extracted fit within any
Steven Spielberg's organization in specific chromosomes of the insects
Their analysis, which is being pub- making a movie based on the novel. they studied.
But in real life, the problems in re-
lished today by the journal Science,
"The most anyone could ever get
challenges a formerly popular theory constructing a dinosaur (or any other from fossil DNA is some molecular
that termites evolved from cockroach-long-extinct animal) from fragmen- sequences that might be grafted into
es. Instead, analysis of the DNA frag-tary gene sequences would be stagger- the genes of some living creature," Dr.
ing if not completely insoluble, experts Poinar said. "But that would require a
ment extracted from the extinct ter-
great advance in cell biology. Remem-
mite, embedded in amber 25 million to agree.
The magnitude of the task is illus ber, no one has yet cloned animal
30 million years old, supports a view
that termites and roaches evolved sep-trated by the DNA sequence extracted cells."
by Dr. Cano and his colleagues from
arately from a common ancestor.
Another investigation, the results of the ancient stingless bee This DNA
Science Fiction and Reality
which were published this month in the fragment is only one ten-thousandth of Still, the notion of creating animals
British journal Medical Science Re- 1 percent of an entire gene, of which similar to dinosaurs by grafting dino-
vast numbers are required to make up saur DNA into living DNA from some
search, examined genetic material re-
a single chromosome in a chain of modern species is not totally ruled out,
covered from a 40-million-year-old ex-
tinct stingless bee called Proplebeia chromosomes. Moreover, the DNA pre- some scientists believe.
"Jurassic
dominicana. The study was conducted served in amber or any other medium Park' is science fiction, of course,"
is always damaged or degraded by said Dr. Wheeler of the Museum of
Natural History, "but Crichton has
time and environmental influences.
by Dr. George O. Poinar Jr., an ento-
versity of California
Dominican amber, regarded as a
treasure house of biological specimens
dating from the Miocene, Oligocene
and Eocene epochs, is too young for the
age of dinosaurs. Amber old enough to
have formed while the dinosaurs were
still alive occurs mainly in Lebanon.

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THE NEW YORK TIMES NATIONAL FRIDAY, SEPTEMBER 25, 1992

Veto of Family-Leave Bill

d 50 or more people to allow workers up
is to 12 weeks of leave, without pay but
d with continued health insurance cover-
i-
age, for personal or family medical
e emergencies.
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American families more than Presi- | semble the two-thirds vote to override. | bill was "the fair thing to do, the right
dent Bush does, or I do." He com- They decided not to vote today or thing to do."
plained that the vote amounted to no Friday, in part to gain time to twist
more than a "big political game" be- arms and in part to let today's victory
cause advocates knew the House would in the Senate, however ephemeral,
stand and get publicity. The vote is now
sustain the veto
Republicans, including expected to be held next Wednesday.
The leading sponsor of the bill Sem
seven who need Democratic votes in
tough races this fall, voted with 54 tor Christopher J. Do
Fourteen
But more Republicans spoke against
the bill. Senator Don Nickles of Oklaho-
ma said, "We don't need the Federal
Government coming in with this dicta-
torial stance"
said, "President Bush is saying 'read Republican in a tough race, Senator cratic effort "to emba ed es, por e-
"When it comes to family leave," he Democrats to override the veto. One Connecticut, said there is a part
Bob Kasten of Wisconsin, voted with dent." He cited a long pads out of a
Mr. Bush; another, John Seymour of can supporters to prove en oude ons is
e my lip service to family values'."
Senator Edward M. Kennedy, Demo-
-crat of Massachusetts, said: "We know
that Bill Clinton would sign it if he were
e in the White House."
e
Senator G. Orrin Hatch, Republican
e of Utah, argued instead for Mr. Bush's
recent proposal to give tax credits to
e employers who offer family-leave poli-
fcies, saying, "No one wants to help
California, did not vote. Three Demo- partisan battle, never h
back the President.
crats voted with 28 Republicans to
House Girds for Battle

the law, saying, "We
House Democratic leaders met this days after its birth, in ord -■ois pas du
afternoon to go over lists of their col- her job."
leagues to see if they could reduce
defections, even if they could not as-lican of Oregon, said that
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sick
sav-
ving
DNA from dinosaurs.
termites and bees perhaps even
older than that recovered from ancient
tion buffs dream of obtaining DNA still
But paleobiologists and science fic-
Quest for Dinosaur DNA
ice for 40,000 years.
a mammoth that had been preserved in
ered was extracted from the carcass of
oldest animal DNA previously recov-
gene involved in photosynthesis. The
magnolia DNA, identified it as part of a
ward M. Golenberg, who isolated the
excavated near Moscow, Idaho. Dr. Ed-
compressed between layers of shale
magnolia leaf found in 1990, which was
ered was from a 17-million-year-old
The oldest DNA previously recov-
study and identify.
lar copies of the target DNA, enough to
able to make great numbers of molecu-
ase chain reaction, the scientists were
copying technique called the polymer-
lyze or study. But by using a chemical
quantities of DNA, far too little to ana-
chemical agents to isolate minute
were treated with a succession of
tions, and body parts of the insects
was cracked open under sterile condi-
In both sets of experiments, amber
nian
Poinar, the son of Dr. Poinar.
Institution,
N.
and Hendrik

po, Dr. David W. Roubik of the Smithso-
Polytechnic Institute at San Luis Obis-
molecular biologist at the California
at Berkeley, with Dr. Raul J. Cano, a
mologist at the on
That will be an exciting discovery."
may contain actual dinosaur DNA. S Ja■don
tually turned into amber. The blood p■an 'nossi jo u
getting trapped in the resin that even-
ach with blood from a dinosaur before ■B■[of a
"we're going to find amber containing
"Sooner or later," Dr. Poinar said, ed que os puv
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O RACK SYSTEM, CAMCORD

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Kennebec. Journal, Augusta, Maine page B-?!
12-13 NOV 1988
Scientists claim bug
to be world's oldest
By LINDSEY TANNER
Associated Press Writer
CHICAGO To the uninitiated,
it looks like two small specks. But to
paleozoologist Conrad Labandeira
and colleagues, the fossil of a
pop-eyed bug represents the oldest
insect known, dating back some 390
million years.
Their findings, reported in Fri-
day's issue of the journal Science,
describe the remarkably well-pre-
served fragments of a wingless bug
found in a chunk of mud on the
north shore of Quebec's Gaspe Bay.
A member of the most primitive
order of insects, it was similar to
modern-day silverfish.
Even more significant than the
fossil's age, scientists say, is that
similarity to modern bugs, suggest-
ing that insects originated many
millions of years before the specimen
lived.
"What we have is two fragments.
We have a head capsule 0.7 milli-
meters wide and we have a thorax 1
millimeter long,' Labandeira, a
38-year-old graduate student at the
University of Chicago, said Friday.
"Even though they're separate,

we're very convinced that they belong to the same individual," he said.

Insects are a class of animals characterized, as adults, by a body divided into head, thorax and abdomen, three pairs of legs on the thorax, and usually two pairs of membranous wings.

The prehistoric bug described in Science was found by Francis Hueber, a noted Smithsonian Institution paleobotanist who retrieved the specimen about five years ago while examining a mud sample he had found on the Gaspe Peninsula. Its importance was only recently discovered when he and other scientists compared notes.

Hueber's interest was in prehistoric plant fragments in the dirt, but what looked like ancient insect parts caught his eye.

"He had an idea that there was something very important" about the fragments, Labandeira said.

Through sophisticated dating techniques, Hueber "determined that it was an early arthropod and probably an insect," said Bret Beall, a scientist at Chicago's Field Museum who has been working with the specimen. The arthropod phylum inverterbrate animals with jointed legs and segmented bodies - includes spiders and crustaceans like shrimp and crabs, for example, as well as insects.

"He knew that if this was an insect fossil it would be very significant, Beall said.

So Hueber handed the specimen over to Beall, who, with Labandeira's help, determined that it was in fact an insect and what they believe is the oldest one known in the world.

It lived 390 million to 392 million years ago and predates what was previously believed to be the oldest insect an eye fragment found in upstate New York by about 15

million years, they said.
Its most imposing features were its two disproportionately large eyes on each side of its head. It also had two antennae and two armlike appendages that appear to have been equipped with sensors to detect odors and vibrations.
"The significance is that they have a head, so it's really a clincher that there were insects at that time," said William Shear, a biology professor at Hampden-Sydney College in Virginia, where the New York specimen is being studied.
"The evidence we have part of an eye and hundreds of scraps of body parts - were suggestive, but not really conclusive," he said. But with the Gaspe finding, "we now know that there were primitive insects back that far. Nobody can challenge that now," Shear said.
"The exciting thing to me is that these insects have changed very little as far as we know in almost 400 million years,'
he said. "That
suggests that they were almost already modern in form 400 million years ago, that they had a long history before that."
The insect, now with Beall at the Field Museum, will eventually be sent to the Smithsonian Institution in Washington for their perman collections, Labandeira

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Bridgeport Post-Telegram Bridgeport, Conn., November 12, 1988
CREAT
INCLUDED VESTED
Conrad Labanderia shows his greatly enlarged drawing of what may be the world's oldest insect, dating back 390 million years.
Fossil find believed
world's oldest insect
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living beings, following kingdom
plant or animal and phylum.
Each class is further broken down
into orders, orders into families, etc.
lege in Virginia, where the New
York specimen is being studied.
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THE NEW YORK TIMES THE ENVIRONMENT TUESDAY, JANUARY 14, 1992
It May Be Elusive but Moth With 15-Inch Tongue Should Be Out There
By NATALIE ANGIER
An orchid needs a
IT may never have been seen by long-tongued insect
human eyes, and it certainly
has never been described in the
scientific literature, but some-
where in the dense tropical highlands
of Madagascar there must flutter a
moth with a tongue that measures 15
inches in length, a scientist says.
Speaking recently at an entomolo-
gy meeting in Reno, Nev., Dr. Gene
Kritsky of the College of Mount St.
Joseph in Ohio said that there was no
alternative but to posit the existence
of a giant moth with a six-inch wing-
span and a longer proboscis than any
Tongue
to reproduce.
yet seen on an insect. He made his
prediction based on the existence of a
rare orchid in Madagascar, a flower
that could only be pollinated by
moth able to stick its tongue way
down a tube where a pool of tempting
nectar is hidden.
The tube of the exotic bloom, called
Angraecum longicalcar, is 16 inches
deep, and it hangs down from the
blossom's stem like a whip; the nec-
tar fills up about an inch on the bot-
tom. Thus, said Dr. Kritsky, a moth
would need to uncoil its proboscis to
15 inches to reach into the tube, called
a nectary, suck up the juice and inci-

dentally detach the orchid's pollen packet at the same time. Dr. Kritsky believes that the pollinating moth is a member of the sphinx moth family, and that it would be found if a diligent scientist willing to brave Madagascar's political chaos were to search for it.

Taking a Cue From Darwin

"The orchid and its pollinator must have co-evolved," said Dr. Kritsky. "The orchid could only survive if it had a moth pollinator.'

The entomologist said he was doing nothing more than taking his cue from Charles Darwin, the great naturalist and occasional soothsayer. In 1862, while studying a Madagascan orchid, Angraecum sesquipedale, Darwin proposed that there must be a moth with an 11-inch tongue, able to dip into the flower's foot-long nectary and pollinate it. In 1903, two entomologists discovered a sphinx moth in Madagascar with a proboscis that matched Darwin's prophecy.

While rummaging through a natural history library last spring, Dr. Kritsky came upon a description of an orchid with an even longer nectary, and he decided it must have a pollinator with an even lengthier tongue. Other entomologists who heard his presentation agreed.

"It seems highly likely that another species of moth with a slightly longer proboscis is out there, able to pollinate that orchid," said Dr. Nathan M. Schiff, a research entomologist with ARSB Research Laboratory in Beltsville, Md., a Government agency. "Darwin got it right, and Gene Kritsky is just following in his footsteps.

Dr. Kritsky said that the orchid and its fertilizing insect probably evolved together over time, with the nectary getting a bit longer, and the moth's tongue following suit, until the relationship between the two became exclusive, a type of interdependence that suited both: the moth, because it

could always be assured of a nectar drink from the orchid, which no other insect could penetrate; and the flower, because it could guarantee that its pollinator would be focusing its efforts on longicalcar and therefore would be likely to deliver fertilizing pollen from one bloom to another.

Projections Trap Insects

Dr. Kritsky said that the orchid discouraged small, scavenging insects like ants from crawling down its tube to gorge on its precious nectar with fingerlike projections along its nectary lining that trap the insects.

To retrieve nectar from the flower, he said, a sphinx moth would have to settle on a lip at the edge of the skinny tube, and carefully uncoil its proboscis. As the moth probed, a pollen packet would shake loose from the orchid and stick to the moth. When the insect flew to another orchid, the packet would become detached and fertilize the recipient flower.

Dr. Kritsky said he has never seen the longicalcar orchid himself, but that the Cincinnati Museum of Natural History, where he works as an adjunct curator, is trying to get a sample. As for its fertilizing moth, because the insect is likely to be nocturnal, and because it must live in a remote region of the Madagascan jungle, where the longicalcar orchid blooms, it may never have been seen by a human being.

"Nathan Schiff told me I had to go find this thing," said Dr. Kritsky. "He said if I didn't, he would do it himself."

Portrait of an Unseen Insect

The existence of a rare orchid with a 16-inch-deep nectar tube has led to the hypothesis that a giant Madagascar moth with a 6-inch wingspan and a 15-inch proboscis must also exist. Above, an artist's version of the only creature that could pollinate the orchid, with its tongue uncoiled.

A

Gene Kritsky

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Nation

Nitric oxide a real turn-on for fireflies

By LEE BOWMAN
Scripps Howard News Service

It turns out that what turns a firefly on and off is the same molecule nitric oxide that makes human blood vessels dilate and allows Viagra to treat erectile dysfunction.

While scientists have known for some time about the chemical reaction that makes a lightning bug light, they were stumped about how the winged beetles manage to blink their tiny lamps so precisely.

"Now we have the missing piece of the puzzle that explains how they're able to throw the switch on and off," said Barry Trimmer, an insect neurobiologist at Tufts University and lead author of the new study published Friday in the journal Science.

There are at least 170 species of fireflies in the United States, with several represented in most backyards. Males and females find each other by using different sequences and patterns of flashes from their lanterns.

"Fireflies are very romantic beasts, because their whole adult life is spent courting," said Sara Lewis, an evolutionary ecologist at Tufts. On a typical summer's night, lightning bugs of different species and sex fire up gradually, some preferring to mate around dusk, others waiting for full darkness. Males tend to do most of the flying; females blink back from leaves and branches.

The summertime light dance of the fireflies is an absolutely critical moment in the life of the small insect, Lewis said.

Fireflies live for two years as larvae, eating worms in the soil, and for just two weeks as adults-enjoying just 14 nights of flying, flashing

and courtship. Then it is all over. "For them, it is a very short, intense time," she said.

While many creatures, from jellyfish to bacteria, have some ability to glow in the dark, Lewis notes that "the firefly's talent for producing precisely timed, rapid bursts of light is quite rare" and worthy of study just for their novelty.

The discovery by an interdisciplinary team that included researchers from Brigham and Women's Hospital in Boston also sheds new light on the roles nitric oxide can play in carrying messages between cells of many living things, including humans.

People suffering from heart pain have been popping nitroglycerin pills for decades, although scientists didn't find out how nitric oxide signals smooth muscle cells lining blood vessels to relax until the 1970s. But if the body produces too much nitric oxide, as it can from trauma or disease, blood pressure can plummet.

Nitric oxide stimulates brain functions involving learning and memory, and is used by the immune system to fight infections and battle tumors. "It's the smallest molecule known to carry messages between cells," said Dr. Thomas Michel, a Brigham and Women's cardiologist, a co-author and Lewis' husband.

In fireflies, the urgent message is passed to a ring of cells around the edge of the lantern region. These cells are packed with mitochondria, miniature power plants that consume oxygen as they produce energy.

The Massachusetts scientists examined the structures inside the firefly lantern and found that the oxygen-burning cells normally act as gatekeepers, preventing oxygen from reaching and reacting with light-producing chemicals in the lantern.

Lowdown
on lightning
They're beetles, not flies.
More than 170 species
in the U.S., but none of
the flashing type of
fireflies is found west of
the Rocky Mountains.
→ Around most of their
U.S. range, they show
up in June and are gone
by the end of August;
they tend to favor
shaded lawns and
damp areas, like bogs
and marshes, but some
species also thrive in
deserts.
In a few species, femme fatale
fireflies mimic the signals of
females of other species to
lure the males, then eat them.
Classic lightning bugs light up with
a chemical reaction that takes place
in special cells in their abdomen.
The chemical reaction is controlled
by the amount of oxygen that the
firefly allows into its abdomen.
They flash because within each species,
males and females identify members of
the opposite sex based on the timing and
movements of their flash.
In the presence of oxygen, the
lantern lights up. That's why, if you
accidentally squish a lightning bug
or one splats on a windshield, the lu-
minescent glow is seen for several
minutes until the stored chemicals
are used up.
When the bug's nervous system
sends a particular signal to gate-
keeper cells, they produce nitric ox-
ide, which shuts down respiration.
That allows oxygen to slip past the
gatekeepers and reach the chemi-
cals in the light cells, producing the
glow.
in
The researchers tested this
mechanism several ways, from
putting fireflies containers
pumped with increasing quantities

of nitric oxide (they glowed ever brighter) to shutting down the signal to produce the molecule, causing the bugs to go dark.

Some species don't light at all, but release special scents to help potential mates find them.

In the new research at Tufts University, scientists found that the control mechanism involves a set of gatekeeping cells that normally keep oxygen from reaching the light-up cells. These biological switches are shut down by the messenger molecule nitric oxide, allowing oxygen inside the lantem and tuming on the light for a brief second or two.

Scripps Howard News Service graphic

Other research has shown that light inhibits nitric oxide, so the fireflies' lanterns themselves act as their dimmer. As the nitric oxide signal fades, the mitochondria resume gobbling oxygen, and the lamps shut down.

"So, amazingly enough, it's a temporary cut in the power supply that probably triggers the firefly flash," Trimmer said.

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The Associated Press contributed to this report